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**(54) Flight Stabilization of Rocket
Propelled Missiles**

**(57) To maintain flight stability of a
rocket powered missile the gas**

passing through the exhaust nozzle is
caused to flow spirally by means of
internal fins or rifling or by forming the
nozzle with a non-circular internal
cross-section twisted helically.

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SPECIFICATION**Flight Stabilization of Rocket Propelled Missiles**

The object of this invention is to stabilize the flight of rocket propelled missiles. The invention applies to missiles which have no control systems. It is common practice to provide missiles of this type with external stabilizing fins. The present invention dispenses with the use of external fins. Flight stability is attained by spinning missiles in a manner similar to the spinning of projectiles shot from rifled gun barrels.

Kinetic energy of gases flowing from rocket thrust chambers is used to provide forces to cause spinning. Gases flowing through rocket exhaust nozzles, or flowing aft of rocket exhaust nozzles, are deviated toward a spiral course, inducing torque reaction. Means by which gas flow is deviated are described in the following examples.

A rocket propelled missile has an exhaust nozzle provided with fins situated either, internally, or aft of the gas exit. The fins have proportions and profiles suitable to the gas velocities produced from the rocket motor. The fins are set at angles of incidence needed to

deviate the gases to flow spirally.

A rocket propelled missile has an exhaust nozzle which is rifled, with grooves of suitable proportions to deviate the gases to flow spirally.

A rocket propelled missile wherein a portion of the length of the exhaust nozzle has a bore of non-circular cross section. (As an example the cross section may be elliptical.) The non-circular portion of the bore is twisted around the centroid of the cross section, maintaining constant alignment with the thrust centre-line of the rocket motor. Gases passing through the twisted portion of the exhaust nozzle are deviated to flow spirally.

Claims

1.-A rocket motor exhaust nozzle of non-circular internal cross-section, twisted helically. The centroid of the cross-section coincides with the centre line of thrust of the rocket.

Amendments to Claims filed on 19th December 1980.

Amended Claims:—

Claims 2 and 3 deleted.